Study on High Dielectric Constant Ceramics. (V) : BaTiO Ceramics for Consenser Materials

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the following equations, we can calculate the elastic constant E_l and E_t for the length and thickness direction respectively.

$$f=\frac{1}{2l}\sqrt{\frac{E_l}{\rho}}, \qquad f=\frac{1}{2t}\sqrt{\frac{E_t}{\rho}}$$

where ρ is density and if $\rho=5{,}5$ is used,

$$E_l=1{,}12\times10^{12}\ \text{dynes/cm}^2$$
$$E_t=1{,}42\times10^{12}\ \text{dynes/cm}^2.$$

The resonant frequency versus temperature curve, we obtained, indicates that the variation of resonant frequency is very small in the temperature range between room temperature and 60°C.

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20. Study on High Dielectric Constant Ceramics. (V)

$BaTiO_3$ Ceramics for Consenser Materials.

Kiyoshi Abe and *Tetsuro Tanaka.*

As the dielectric constant versus temperature curve of $BaTiO_3$ ceramics is comparetively flat at about room temperature, $BaTiO_3$ ceramics are useful as a condenser material. In special case, when the temperature coefficient is not so serious matter and very high dielectric constant is desired, such ceramics that have Curie point near room temperature are used. We previously experimented that in the solid solution of $BaTiO_3$ and $SrTiO_3$, the Curie point is shifted to lower temperature approximately in proportion to the amount of $SrTiO_3$, and the mixture containing 25% $SrTiO_3$ has Curie point at about room temperature. Recently, we developed these experiments and [studied on some solutions such as (Ba–Sr–Mg) TiO_3 or (Br–Sr–Pb) TiO_3 with various compositions.] The ratio of Ba : Sr is chosen 10 : 0, 9 : 1, 8 : 2, 7 : 3 etc., and to these mixture Mg or Pb is added from zero to 50 percent.

Addition of small quantity of $MgTiO_3$ shifted the Curie point to lower temperature, while large amount of $MgTiO_3$ only decreased the dielectric constant without any remarkable influence on the shifting of Curie point. For example, a mixture of $BaTiO_3$ 81%, $SrTiO_3$ 9%, $MgTiO_3$ 10%, has dielectric constant of about 4,000 and loss angle of about 50×10^{-4} at Curie point near 40°C. The addition of $PbTiO_3$ generally shifted the Curie point to higher temperature in proportion to the quantity of $PbTiO_3$, and addition of large amount of it reduced the dielectric constant. For example, a mixture of $BaTiO_3$ 72%, $SrTiO_3$ 18%, $PbTiO_3$ 10%, has dielectric constant of about 4500 and loss angle of about 150×10^{-4} at Curie point near 40°C. The characteristics of dielectric constant versus temperature are somewhat flattend by adding $MgTiO_3$ or $PbTiO_3$ in both cases. The firing of such ceramics is considerably easy as compared with that of pure $BaTiO_3$ ceramics.